

**Draft Resource Action Matrix - Environmental Workgroup  
Oroville Facilities Relicensing  
April 23, 2003**

The following Resource Action Matrix contains a list of the proposed resource actions distributed at the February 19, March 26, and April 23, 2003 EWG meetings. At previous EWG meetings, potential resource actions were organized by geographic area, often resulting in actions that were listed in multiple locations (e.g., improving side-channel habitat for juvenile salmonids). To address this problem, the resource actions were sorted by resource goal statements instead of by geographic area to facilitate analysis within a topic area. Where possible, the resource actions listed in the matrix were modified to improve clarity, but all potential resource actions were taken directly from bullets provided in the geographic area discussions.

The matrix has been designed to act as a 'living document' to help organize and track the proposed resource actions as the PM&E development process moves forward. Tracking resource actions is important to FERC and other participants that are involved in the relicensing process. Numbers have been designated for each potential resource action (EWG-1 through EWG-102) in the matrix to facilitate comment tracking and to cross-reference the matrix with the previous geographic area discussions (now combined into one draft report). As additional resource actions are developed, modified, or eliminated by the EWG, the matrix will be updated. This matrix is designed to support the previous geographic area discussions and the upcoming PM&E development and analysis process.

The matrix is organized by topic area, but also lists the geographic area resource actions could impact. Each proposed resource action has been identified as a protection (P), mitigation (M), or an enhancement (E) measure, although these assignments could change as definitions for each type of measure are clarified. The matrix contains information on what types of activities would be needed to initiate the action (flow modifications, heavy equipment usage, operation and maintenance measures, permitting, etc.). The matrix also notes if additional information from future or ongoing studies is needed to evaluate the proposed resource action. As a starting point, preliminary comments associated with each resource action also have been added to the matrix. As the EWG continues to evaluate the potential resource actions, the matrix will be modified to track the group's decisions. The matrix will include pertinent information from ongoing studies to justify those decisions, as appropriate.

Preliminary: For Environmental Work Group Discussion Only				Resource Action Information							
Resource Action Number	Geographic Areas	Project Impact Addressed	Description of Proposed Resource Action (Solution)	P/M/E	Flow Related	Construction/Heavy Equipment	O&M	Permitting	X-Resource/Area Impact	Additional Info Needed	Comments
Aquatic Resources - Provide for Upstream Passage of Anadromous Fish											
EWG-1	Low Flow Channel	Impaired Fish Passage	Open Fish Barrier Pool to fish passage and allow the pool to be used as a spring Chinook salmon holding and spawning area. Requires the addition of a fish ladder to the Fish Barrier Dam or modifying the existing ladder with a branch to the Fish Barrier Pool. (FR-1)	E	X	X	X	X		X	Information is needed on feasibility of creating spawning habitat for spring-run Chinook salmon in Fish Barrier Pool (March-June).
EWG-2	Low Flow Channel	Impaired Fish Passage	Install a weir at lower end of low flow section to selectively pass desired fish species into the low flow channel. Currently, fishes in the Feather River are allowed free access into the upper portions of the low flow channel. This Resource Action would address concerns about high salmonid spawning densities in the low flow channel and provide an opportunity to segregate the spring and fall runs of Chinook salmon in the Feather River. A related benefit of this Resource Action would be a reduction in the number of predators in the low flow channel as a result of selected passage. This action would impact the Feather River Fish Hatchery broodstock collection.(FR-2)	E	X	X	X	X		X	Related to EWG-34 & EWG-42.
EWG-3	Low Flow Channel	Impaired Fish Passage	This Resource Action would increase flows during critical upstream passage periods for anadromous fishes in the Feather River. Currently, flows in the low flow reach are maintained at 600 cfs, except during flood events or occasional temporary changes in project operations. The level of flow increase needed to provide sufficient attraction flow, or to reduce holding time below passage impediments, is not known at this time. (FR-3)	E	X			X	X	X	Potential cross-resource impact on riparian vegetation and fluvial processes, depending on the magnitude of flow alterations. Timing of increased flows would benefit salmonids: March-June (spring-run Chinook salmon), September-December (fall-run Chinook salmon), September-January (steelhead), and May-June (shad). Uncertain if increased flow improves fish passage over impediments in low flow reach.

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EWG-4	High Flow Channel	Impaired Fish Passage	Increase flows from the Thermalito Afterbay Outlet to the high flow section of the Feather River to provide increased quantities of productive rearing habitat (off channel areas, floodplains). Related benefits of this Resource Action could include the encouragement of upstream migration of adult fishes (salmon, sturgeon, splittail, shad, etc) and reducing holding time below passage impediments. (FR-15)	E	X			X	X	X	Potential cross-resource impact on riparian vegetation and fluvial processes, depending on the magnitude of flow alterations. Uncertain how much flow needed to increase quantity of rearing off-channel habitat.
EWG-5	High Flow Channel	Impaired Fish Passage	Under low flow conditions, Shanghai Bench and Sunset Pumps may be impassable for anadromous fish species due to water velocities in some areas and a vertical height barrier. Structurally modify the Sunset Pumps and Shanghai Bench areas to aid passage of green sturgeon, Sacramento splittail, and other anadromous species. This Resource Action would provide physical changes to these areas to aid anadromous fish passage. (FR-16, FR-17)	E	X	X		X	X		Combines related Resource Actions related to Sunset Pumps from February 19 and March 26, 2003 meeting.
EWG-6	High Flow Channel	Impaired Fish Passage	Re-condition the existing benches along the lower Feather River reach to improve fisheries conditions. (FR-18)	E		X		X	X		Uncertain how reconditioning benches would improve fisheries conditions. Related to EWG-19.
EWG-7	High Flow Channel	Impaired Fish Passage	Assist in field calibration of sturgeon passage information from University California-Davis studies (conducted in lab in 2003). (FR-19)								Not a PM&E.
EWG-8	High Flow Channel	Impaired Fish Passage	Conduct field-tracking studies to determine timing and movement patterns of sturgeon in Feather River (i.e., field-verify whether passage is indeed limiting). (FR-20)								Not a PM&E.
EWG-9	High Flow Channel	Impaired Fish Passage	Provide attraction flows via the low flow channel to encourage upstream migration of native anadromous fishes. Also to allow passage over barriers in lower Feather River. The level of flow increase needed to provide sufficient attraction flow, or to reduce holding time below passage impediments, is not known at this time. (FR-21)	P	X			X	X	X	Ongoing field evaluation of fish passage in high flow channel in spring 2003. Related to EWG-5.

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EWG-10	Thermalito Complex	Passage of Stocked Fish Into Feather River	Install a device at the Thermalito Afterbay Outlet that will prevent downstream passage of planted fishes from the Thermalito Complex into the Feather River. Currently rainbow trout are stocked in the Thermalito Forebay for a "put and take" fishery. This Resource Action will address concerns about hatchery-origin trout mixing with natural steelhead in the Feather River. (TC-1)								Current level of trout passage into the Feather River from Thermalito Afterbay Outlet undetermined. Not a PM&E. <b>Could be combined with EWG-11.</b>
EWG-11	Thermalito Complex	Passage of Stocked Fish Into Feather River	Install a fish-counting device at the Thermalito Afterbay Outlet associated with a low-head dam to monitor all fish passage into the Feather River. Install a fish-counting device at the fish passage facility at Oroville Dam to monitor fish passage into the Lake Oroville. (TC-2)								Not a PM&E. <b>Could be combined with EWG-10.</b>
EWG-12	Upstream Tributaries	Impaired Fish Passage	Provide resident salmonids with access to the upstream tributaries by removing sediment plugs, boulders, and manmade barriers. This Resource Action could include the removal of Big Bend Dam or the construction/repair of fish passage facilities at this site to open up the Poe Reach. (LO-5, LO-6, LO-7)	E	X	X	X	X	X	X	Combines three similar Resource Actions. Related to EWG-39 & EWG-100.
Aquatic Resources - Improve Habitat for Anadromous and Resident Fish											
EWG-13	Low Flow Channel	Limited Woody Debris Recruitment	Add woody debris in the Feather River. Large woody debris would be anchored or inserted into the river at target locations to provide increased habitat complexity. This Resource Action would provide the related benefit of increasing organic inputs in supplementation areas. (FR-4, FR-23)	E		X	X	X	X		Related to EWG-20.
EWG-14	Low Flow Channel	Insufficient Holding Habitat for Adult Spring-Run Chinook Salmon	Create deep pools in low-flow reach of Feather River to provide holding habitat for spring Chinook salmon. Deep pools would be created in reaches where water temperatures are expected to be cool enough to provide summer habitat for spring-run Chinook salmon. (FR-5)	E	X	X	X	X		X	No supporting data. Ongoing studies to determine when and where spring-run Chinook over-summer in the low flow channel.

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EWG-15	Low Flow Channel	Insufficient Spawning Habitat for Chinook Salmon and Steelhead	Increase flows in the low-flow reach of the Feather River during the spawning season of protected or sensitive species to increase spawning habitat utilization. (FR-6)	E	X			X	X	X	Needs further analysis. Ongoing studies associated with SP-G2 will provide data. Also see IFIM study.
EWG-16	Low Flow Channel	Insufficient Rearing Habitat for Juvenile Fish Species	Restore and/or improve habitat in side channels adjacent to the low-flow reach in the Feather River. The increased habitat complexity will benefit protected, sensitive, or other desired juvenile fish species. (FR-7, FR-8)	E	X			X	X	X	Needs further analysis. Ongoing studies associated with SP-G2 will provide data. <b>Could be combined with EWG-21 &amp; EWG-53.</b>
EWG-17	Low Flow Channel	Insufficient Rearing Habitat for Juvenile Fish Species	Enhance riparian vegetation and trees along banks for shading and increased habitat complexity. (FR-9)	E			X	X	X		One location for vegetation enhancement could be trailer park riffle along east side, although drawback is that high-water events may require continued maintenance/improvement of this area.
EWG-18	Low Flow Channel	Insufficient Spawning Habitat for Chinook Salmon and Steelhead	In areas where armoring has occurred, selected sections of the low-flow reach of the Feather River would be dredged with the goal of improving spawning gravel quality. (FR-10)	E			X	X	X	X	Need to define dredging. Areas suitable for dredging are uncertain at this time; further information will be obtained after results from SP-G2 have been issued. May impact water quality. Related to EWG-95.
EWG-19	High Flow Channel	Insufficient Spawning Habitat	Build "benches" at various stages along the reach to ensure that splittail and green sturgeon always have usable habitat. (FR-22)	E		X	X	X	X	X	Uncertain how benches would improve habitat for native fish species. Related to EWG-6.
EWG-20	High Flow Channel	Limited Woody Debris Recruitment	Add woody debris in the Feather River. Large woody debris would be anchored or inserted into the river at target locations to provide increased habitat complexity. This Resource Action would provide the related benefit of increasing organic inputs in supplementation areas. (FR-23, FR-4)	E		X	X	X	X		Related to EWG-13.



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EWG-21	High Flow Channel	Insufficient Rearing Habitat for Juvenile Fish Species	Increase quantity of shallow water rearing habitat in the high flow section of Feather River from higher flows. (FR-24)	E	X			X	X	X	Could be combined with EWG-16 & EWG-53.
EWG-22	High Flow Channel	Insufficient Rearing Habitat for Juvenile Fish Species	Increase connectivity between river channel and lateral habitats (including side channels) in lower Feather River by removing levees to create seasonal habitats for salmon, splittail and other fishes. (FR-25)	E	X	X	X	X	X	X	Ongoing studies associated with SP-G2 will provide additional data. Related to EWG-23, EWG-25, EWG-36 & EWG-98.
EWG-23	High Flow Channel	Insufficient Rearing Habitat for Juvenile Fish Species	Provide longer duration flows in winter/spring. Provide flow in the low flow channel to restore geomorphic process (sediment transport), improve spawning habitat, and inundate floodplains to provide high quality rearing habitat. This Resource Action would provide higher flows which would increase quantity of fish rearing habitat. (FR-26)	E	X			X	X	X	Ongoing studies associated with SP-G2 will provide additional data. Related to EWG-22, EWG-25, EWG-36 & EWG-98.
EWG-24	High Flow Channel	Insufficient Rearing Habitat for Juvenile Fish Species	Purchase lands with quality gravel sources or substrates adjacent to the river. Dedicate these areas for permanent juvenile fish nursery areas. (FR-27)	E							More information needed on potential sizes for land acquisition.
EWG-25	High Flow Channel	Insufficient Rearing Habitat for Juvenile Fish Species	Use flow releases from the Thermalito Afterbay Outlet to provide additional floodplain habitats adjacent to the river channel.(FR-28)	E	X			X	X	X	Unclear how much increased flow is needed to inundate areas. EWG-22, EWG-23, EWG-36 & EWG-98.
EWG-26	Thermalito Complex	Proliferation of Aquatic Weeds	Control aquatic weeds to enhance fish habitat in the project area. Aquatic weed control could be accomplished using various methods, including but not limited to mechanical control and altering the water levels. (TC-3, TC-11)	P	X		X	X			Could be combined with EWG-30.
EWG-27	Thermalito Complex	Proliferation of Aquatic Weeds	Provide habitat enhancement in areas without weeds, primarily through added structure, for warmwater or other target species. (TC-4)	P		X		X			
EWG-28	Thermalito Complex	Insufficient Rearing Habitat for Juvenile Fish Species	Fill or reclaim Robinson Riffle Borrow pond used for gravel extraction. (TC-5)	E		X		X		X	

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EWG-29	Thermalito Complex	Limited Habitat Complexity	Manage water levels in the Thermalito Afterbay to provide increased habitat complexity for warmwater species. There are operational constraints, however, to how quickly the Thermalito Complex can decrease flows. (TC-6)	P	X				X		Limits operational flexibility.
EWG-30	Oroville Wildlife Area	Proliferation of Aquatic Weeds	Control aquatic weeds to enhance fish habitat in the project area. Aquatic weed control could be accomplished using various methods, including but not limited to mechanical control, chemicals, or altering the flows. (TC-12, TC-3)	P	X		X	X			Could be combined with EWG-26.
EWG-31	Lake Oroville	Bass Nest Mortality	Regulate reservoir drawdowns to reduce nest stranding and subsequent mortality of bass species. (LO-1)	P	X				X		Drawdown less than 9 ft/month.
EWG-32	Lake Oroville	Loss of Bass Habitat	Develop/modify habitat enhancement program for fish rearing/refuge in Lake Oroville through the placement of woody debris, Christmas tree reefs, or other, yet to be determined, method. This Resource Action could include enhancement of spawning and nesting shelters for resident fish (bass and catfish) in the shallow areas of Lake Oroville. Habitat enhancement may incorporate the addition of old tires, riprap, concrete, or weighted pipes, or by adding rocky pints or artificial reefs in the shallow areas of Lake Oroville. This Resource Action is related to drawdown because selecting areas for habitat improvement will need to take into account seasonal fluctuations of the reservoir.(LO-4)	E		X	X	X			Similar program has been conducted in recent years.
Aquatic Resources - Provide Anadromous Fish Populations to Support Desired Ecological Function											

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EWG-33	Upstream Tributaries	Potential Nutrient limitation in Upper Tributaries	This Resource Action would supplement nutrient-poor tributaries to Lake Oroville with salmon carcasses or carcass analogs to increase levels of marine-derived nutrients (assuming nutrient concentrations are considered limiting factor). (LO-8)	E			X	X	X	X	Nutrient sampling as part of SP-W1 will provide baseline condition data. Related to removing fish passage barriers in upstream tributaries to enhance nutrient cycling. Could have cross-resource impact with riparian vegetation at supplementation sites from increased nutrient loading. If carcasses used, timing of supplementation likely late-winter/early spring, but depends on carcass availability.
Aquatic Resources - Minimize Impacts that Increase Predation on Salmonids and other Native Aquatic Species											
EWG-34	Low Flow Channel	Predation on Juvenile Fish Species	Exclusionary devices (e.g., weirs) placed at the lower part of the low flow section would have a potential benefit of reducing predation on salmonids in the low flow section of the Feather River. (FR-14)	P		X	X	X			No evidence of predator problem in low flow channel. Sacramento pikeminnow most common native predator. Related to EWG-2 & EWG-42.
EWG-35	Thermalito Complex	Predation on Juvenile Fish Species	Lower existing water temperatures at the Thermalito Afterbay Outlet for the purpose of reducing feeding rates for predators in the Feather River. (TC-9)	P				X	X	X	Data needed on impact of cooler flows to Feather River biotic resources. Unclear how to lower temperatures in Thermalito Afterbay or to what extent colder releases from the Thermalito Afterbay could lower Feather River water temperatures. No evidence of predator problem at Thermalito Afterbay Outlet.
Aquatic Resources - Minimize Impacts on Flow and Temperature in Project Waters											



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EWG-36	High Flow Channel	Impaired Fish Passage	Use high flow pulses in winter-spring (Feb-May) as cues to enhance upstream migration of spring-run salmon, shad, steelhead, sturgeon, and splittail. (FR-29)	E	X			X	X	X	Uncertain if increased flow levels would improve success of fish passage. Related to EWG-22, EWG-23, EWG-25 & EWG-98.
EWG-37	Thermalito Complex	Decreased Habitat Quality Related to Project Operations	Operate the Thermalito Complex in a manner which would provide additional cold water in the low flow channel of the Feather River for benefit of salmonids. (TC-7)	E	X			X	X	X	Uncertain how much cooler water needed from Thermalito Complex that could affect water temperatures in the Feather River.
EWG-38	Lake Oroville	Decreased Habitat Quantity for Coldwater Species	Water surface elevations in Lake Oroville would be managed to minimize "squeezing" of coldwater fish into the metalimnion and hypolimnion. (LO-3)	E	X				X	X	Relationship between coldwater habitat and drawdown unclear at this time. Related to EWG-52.
EWG-39	Upstream Tributaries	Impaired Fish Passage	Remove sediment plugs in the mouths of the upstream tributaries to provide adequate flow suitable for salmon and steelhead spawning. (LO-6)	E	X	X	X	X	X	X	More information needed on the location of these areas. Related to EWG-12 & EWG-100.
Aquatic Resources - Minimize Hatchery Impacts on Anadromous Salmonids and Resident Fish											
EWG-40	Low Flow Channel	Salmon Survival Related to Feather River Fish Hatchery	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)								Not a PM&E. <b>Could be combined with EWG-45, EWG-48, &amp; EWG-51.</b>
EWG-41	Low Flow Channel	Over-Escapement Related to Hatchery Production	Decrease hatchery production of salmon so that there is less crowding and competition for limited spawning habitat in the low flow section of the Feather River. (FR-12, FR-31)								Not a PM&E. <b>Could be combined with EWG-44.</b>
EWG-42	Low Flow Channel	Genetic Integrity of Chinook salmon	Use a weir to monitor and restrict access of returning hatchery-origin adults to the low flow section of the Feather River. This Resource Action potentially would reduce genetic introgression between Chinook races and between hatchery/wild salmonids. This Resource Action also would potentially reduce crowding and competition for limited spawning habitat. (FR-13) (FR-32)	P		X	X	X		X	Related to EWG-2 & EWG-34.

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EWG-43	High Flow Channel	Salmon Survival Related to Feather River Fish Hatchery	Release hatchery steelhead at a smaller size or alter release timing so they do not present a predation problem for wild salmonids. (FR-30)								Not a PM&E.
EWG-44	High Flow Channel	Over-Escapement Related to Hatchery Production	Decrease hatchery production of salmon so that there is less crowding and competition for limited spawning habitat in the low flow section of the Feather River. (FR-12, FR-31)								Not a PM&E. <b>Could be combined with EWG-41.</b>
EWG-45	High Flow Channel	Salmon Survival Related to Feather River Fish Hatchery	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)								Not a PM&E. <b>Could be combined with EWG-40, EWG-48, &amp; EWG-51.</b>
EWG-46	Thermalito Complex	Loss of Fish Production Related to Oroville Facilities	Evaluate current rainbow trout stocking program in Forebay to look at angler preferences and to prevent the spread of fish diseases. Screen all stocked fish for fish diseases. Potentially cease fish planting in Thermalito Complex to prevent deleterious effects on natural fishes in the Feather River. (TC-8)								Not a PM&E.
EWG-47	Thermalito Complex	Loss of Fish Production Related to Oroville Facilities	Create salmonid stocking program in Afterbay similar to trophy program in Forebay. (TC-10)								Not a PM&E. Cold water needs in Afterbay for stocked fish could impact rice farmer needs. Also could implement program in Fish Diversion Pool.
EWG-48	Thermalito Complex	Salmon Survival Related to Feather River Fish Hatchery	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)								Not a PM&E. <b>Could be combined with EWG-40, EWG-45, &amp; EWG-51.</b>
EWG-49	Oroville Wildlife Area	Loss of Fish Production Related to Oroville Facilities	Create trout stocking program in suitable OWA ponds. Program would operate seasonally and all stocked fish would be screened for disease. (TC-12)	M			X	X		X	
EWG-50	Oroville Wildlife Area	Loss of Fish Production Related to Oroville Facilities	Stock warmwater species (e.g., Florida strain bass) in selected OWA ponds to create trophy angling areas. (TC-13)	M			X	X		X	

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EWG-51	Lake Oroville	Salmon Survival Related to Feather River Fish Hatchery	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)								Not a PM&E. <b>Could be combined with EWG-40, EWG-45, &amp; EWG-48.</b>
EWG-52	Lake Oroville	Loss of Fish Production Related to Oroville Facilities	Develop cold water fishery in Lake Oroville. This Resource Action would involve developing management protocols for the coldwater fishery upstream of Lake Oroville as well as in the reservoir. (LO-3)	M			X	X		X	
Terrestrial Resources - Enhance and Protect Terrestrial Habitat for Native Plant and Animal Species											
EWG-53	Low Flow Channel	Insufficient Riparian Habitat	Increase quantity of shallow water rearing habitat in the low flow section of Feather River from higher flows. (FR-33)	E	X		X	X	X	X	<b>Could be combined with EWG-16 &amp; EWG-21.</b>
EWG-54	Low Flow Channel	Insufficient Riparian Habitat	Increase rearing habitat in side channels via habitat enhancement. (FR-34)	E	X	X		X	X	X	More information needed on locations of this action.
EWG-55	Low Flow Channel	Insufficient Riparian Habitat	Enhance riparian vegetation and trees along banks for shading and increased habitat complexity. One location for vegetation enhancement could be trailer park riffle along east side, although high-water events may require continued maintenance/improvement of this area. (FR-35)	E				X	X		
EWG-56	Low Flow Channel	Terrestrial Impacts from Recreational Use	Modify recreational use patterns in Feather River to minimize impacts to important terrestrial species (exact measures dependent on analysis in upcoming report) (FR-36, FR-40)	P							<b>Could be combined with EWG-58 &amp; EWG-62.</b>
EWG-57	High Flow Channel	Insufficient Wildlife Habitat	Provide improved vegetation cover and improved screening within important corridors. (FR-41)	E				X			<b>Could be combined with EWG-59 &amp; EWG-63.</b>
EWG-58	Thermalito Complex	Terrestrial Impacts from Recreational Use	Modify recreational use patterns in Thermalito Complex to minimize impacts to important terrestrial species (exact measures dependent on analysis in upcoming report) (TC-14)	P							<b>Could be combined with EWG-56 &amp; EWG-62.</b>
EWG-59	Thermalito Complex	Insufficient Wildlife Habitat	Provide improved vegetation cover and improved screening within important corridors. (TC-15)	E				X			<b>Could be combined with EWG-57 &amp; EWG-63.</b>

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EWG-60	Thermalito Complex	Loss of habitat for migrating waterfowl	Add more brood ponds to accommodate migrating waterfowl in the Thermalito Afterbay. (TC-16)	E						X	Must consider land availability.
EWG-61	Thermalito Complex	Loss of Habitat for Migrating Waterfowl	Use native species to enhance upland cover in the vicinity of the Thermalito Afterbay for the benefit of migrating waterfowl. Upland cover enhancement can provide higher nesting densities (2-3 nests/acre) for waterfowl than current brood ponds. (TC-17)	E							Irrigation of installed upland cover would need to be addressed.
EWG-62	Oroville Wildlife Area	Terrestrial Impacts from Recreational Use	Modify recreational use patterns in Feather River and OWA reach to minimize impacts to important terrestrial species. (TC-26)	P							Exact measures dependent on report. <b>Could be combined with EWG-56 &amp; EWG-58.</b>
EWG-63	Oroville Wildlife Area	Insufficient Wildlife Habitat	Provide improved vegetation cover and screening within important corridors within the OWA. (TC-27)	E				X			<b>Could be combined with EWG-57 &amp; EWG-59.</b>
EWG-64	OWA	Insufficient Riparian Habitat	Develop a hydrologic regime (management protocols) to support natural regeneration of riparian vegetation along the Feather River. (FR-39, TC-18, TC-28)	E	X		X			X	Not further defined at this time. <b>Could be combined with EWG-69.</b> Could involve removing beaver dams or developing protocols to address enhancement for cottonwood trees. Could involve digging down through rock piles to water table to fill ponds for benefit of turtles.
EWG-65	Lake Oroville	Quantity of Upland Habitat	Implement appropriate vegetation or restoration activities to enhance or restore native plant communities in the Lake Oroville upland areas.(LO-9)	E						X	Potential sites not defined at this time.
EWG-66	Lake Oroville	Terrestrial Impacts from Recreational Use	Retrofit existing Lake Oroville recreational facilities to remove potential food sources, nesting sites, and rodent refuge areas for nuisance or pest species. (LO-10)	E						X	
EWG-67	Lake Oroville	Terrestrial Impacts from Recreational Use	Implement measures to reduce populations of nuisance non-native wildlife in the Lake Oroville areas. (LO-11)	E						X	Not further defined at this time.
EWG-68	Lake Oroville	Terrestrial Impacts from Recreational Use	Implement measures to reduce recreational disturbances on wildlife populations as need based on the results of study plan SP-T9. (LO-12)	E			X			X	Not further defined at this time.



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Terrestrial Resources - Enhance and Protect Riparian Habitats											
EWG-69	High Flow Channel	Insufficient Riparian Habitat	Develop a hydrologic regime to support natural regeneration of riparian vegetation along the Feather River. (FR-39, TC-18)	P	X		X		X	X	Not further defined at this time. <b>Could be combined with EWG-64.</b>
EWG-70	Thermalito Complex	Insufficient Riparian Habitat	Initiate active vegetation plantings in Thermalito Afterbay area. (TC-19)	M				X		X	
EWG-71	Thermalito Complex	Loss of Habitat for Migrating Waterfowl	Maintain brood ponds and constant elevations during spring breeding season. (TC-20)	P	X				X	X	Limits operational flexibility at Thermalito Complex.
Terrestrial Resources - Control the Dispersal of Non-Native Plant Species											
EWG-72	Low Flow Channel	Proliferation of Non-Native Plants	Eliminate noxious plants via herbicidal treatment or mechanical control. (FR-37, FR-42, TC-21, TC-29)	E				X		X	May require continued maintenance due to periodic high-flow events or evaluation of appropriate technique. <b>Could be combined with EWG-76.</b>
EWG-73	High Flow Channel	Proliferation of Non-Native Plants	Develop flow regime to control establishment of noxious species below the Thermalito Afterbay Outlet (FR-43)	P	X				X	X	Not further defined at this time.
EWG-74	High Flow Channel	Proliferation of Non-Native Plants	Develop construction and recreational management protocols to control the spread of noxious species. (FR-44, TC-22)								Not a PM&E. <b>Could be combined with EWG-77, EWG-80, &amp; EWG-83.</b>
EWG-75	Thermalito Complex	Proliferation of Non-Native Plants	Control exotic and noxious plant species with water elevation changes in the Thermalito Complex. This Resource Action would require operational changes at the Thermalito Complex and further information on the life history traits and distribution of exotic and noxious plant species in the area. (TC-23)	E				X		X	Need information on whether target plant species will be affected by periodic dewatering or submersion associated with water elevation changes in the Thermalito Complex.
EWG-76	Oroville Wildlife Area	Proliferation of Non-Native Plants	Eliminate noxious plants via herbicidal treatment or mechanical control. (FR-37, FR-42, TC-21, TC-29)	E				X		X	May require continued maintenance due to periodic high-flow events or evaluation of appropriate technique. <b>Could be combined with EWG-72.</b>



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EWG-77	Oroville Wildlife Area	Proliferation of Non-Native Plants	Develop construction and recreational management protocols to control the spread of noxious species. (FR-44, TC-22, TC-30)								Not a PM&E. Would address dispersal of primrose. <b>Could be combined with EWG-74, EWG-80 &amp; EWG-83.</b>
EWG-78	Oroville Wildlife Area	Proliferation of Non-Native Plants	Develop hydrologic regime to support and protect native riparian vegetation in the Oroville Wildlife Area. This Resource Action would incorporate life history traits and distribution of native and non-native species from ongoing studies, in addition to information on groundwater and surface water supply in the vicinity of the OWA. (TC-31)	P	X		X		X	X	Not further defined at this time. Could involve deepening ponds so they do not dry up.
Terrestrial Resources - Protect and Enhance Populations of T&E Plant and Animal Species											
EWG-79	Low Flow Channel	Overall Impact to T&E Species	Enhance or add riparian habitat for threatened and endangered species in the low flow section of the Feather River. (FR-38)	E				X	X	X	At this time, this Resource Action is not specific to locations within the low flow section of the Feather River or species that would be involved in riparian enhancement (may require continued maintenance due to periodic high-flow events). The addition of riparian habitat may require land acquisition. Could be combined with EWG-82.
EWG-80	High Flow Channel	Overall Impact to T&E Species	Develop maintenance and recreational management protocols to avoid impact to special status species within the project area. Specific measures associated with this Resource Action are not identified at this time. (FR-45, TC-24)							X	Not a PM&E. <b>Could be combined with EWG-74, EWG-77,&amp; EWG-83.</b>
EWG-81	Thermalito Complex	Overall Impact to T&E Species	Provide upland cover enhancement in the vicinity of the Thermalito Afterbay for the benefit of migrating waterfowl. Upland cover enhancement can provide higher nesting densities (2-3 nests/acre) for waterfowl than current brood ponds. (TC-25)	E				X			This Resource Action would need to address irrigation concerns related to enhancement areas.

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EWG-82	Oroville Wildlife Area	Overall Impact to T&E Species	Enhance riparian habitat for threatened and endangered species in the OWA. At this time, this Resource Action is not specific to locations within the OWA. (FR-38, TC-32)	E				X	X	X	Some areas could require continued maintenance due to periodic high-flow events. Could be combined with EWG 79
EWG-83	Oroville Wildlife Area	Overall Impact to T&E Species	Develop maintenance and recreational management protocols to avoid impact to special status species within the project area. Specific measures associated with this Resource Action are not identified at this time. (FR-45, TC-24, TC-33)							X	Not a PM&E. <b>Could be combined with EWG-74, EWG-77,&amp; EWG-80.</b>
EWG-84	Lake Oroville	Overall Impact to T&E Wildlife Species	Develop disturbance avoidance plans in the vicinity of nest sites during the nesting season of bald eagles and peregrine falcons. (LO-13)	P						X	Not further defined at this time.
EWG-85	Lake Oroville	Overall Impact to T&E Plant Species	Develop protection and avoidance protocols for sensitive plant populations in the Lake Oroville Area. (LO-14)							X	Not a PM&E.
Water Quality -- Maintain and Protect Water Quality for All Beneficial Uses											
EWG-86	Low Flow Channel	Impaired Water Quality	Operate the Thermalito Complex to provide colder water to Lower Feather River for the benefit of salmonids. (EWG-35). (FR-46)	P	X			X	X	X	Related to EWG-35 & EWG-90.
EWG-87	Low Flow Channel	Impaired Water Quality	The settling ponds associated with the Feather River Fish Hatchery are designed to hold effluent until evaporation occurs, but there is high connectivity between the ponds and the Feather River. Leaching occurs from the settling ponds to the Feather River. The ponds' gravel bottom provides some unknown level of filtration. This Resource Action would construct new settling ponds at the existing location or in a different area that would prevent leaching and/or enhance evaporation. (FR-47)	P		X	X	X			May reduce flow in 'Hatchery Ditch', which is heavily used Chinook spawning area.
EWG-88	Low Flow Channel	Impaired Water Quality	Line existing holding pond with impermeable barrier to prevent leaching (FR-48)	P		X	X				May reduce flow in 'Hatchery Ditch', which is heavily used Chinook spawning area.

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EWG-89	Low Flow Channel	Impaired Water Quality	Assuming further toxic screening indicates problems, post “no swim” or “don’t eat fish” warnings anywhere that tissue and/or sediment results suggest problems may be present. (FR-49)								Not a PM&E.
EWG-90	Thermalito Complex	Altered Water Temperatures for Agriculture	Operate the Oroville Complex in a manner to minimize the warming of water released at the Thermalito Afterbay Outlet. (FR-47)	P	X			X	X	X	Related to EWG-86.
Fluvial Processes - Maintain and Enhance Aquatic and Terrestrial Habitat											
EWG-91	Low Flow Channel	Spawning Gravel Quantity	Supplement the low-flow reach with suitable spawning gravel to increase productivity (i.e., # fish produced per unit area). (FR-50)	E		X	X	X	X	X	This option likely would require continued gravel supplementation over time. Gravel could be obtained from OWA. Ongoing field analysis associated with SP-G2 will provide additional data. Related to EWG 96.
EWG-92	Low Flow Channel	Spawning Gravel Quantity	Increase flows in the low-flow reach of the Feather River reach to increase available spawning habitat. This Resource Action would increase flows above current levels (600 cfs) during peak Chinook spawning to increase the quantity of habitat available for salmonids. (FR-51)	E	X		X	X	X	X	This Resource Action would need to keep flows up during periods of fish spawning so as to not dewater redds. Ongoing field analysis associated with SP-G2 will provide additional data. Related to EWG-3,EWG-4,EWG-9, EWG-15, EWG-25, EWG-36, & EWG-53.
EWG-93	Low Flow Channel	Spawning Gravel Quantity	Create levy setbacks to increase meandering nature of river and improve gravel composition in critical spawning reaches of the low-flow reach (FR-52)	E	X	X		X		X	Ongoing field analysis associated with SP-G2 will provide additional data.
EWG-94	Low Flow Channel	Spawning Gravel Quantity	Dredge sections of the low-flow reach to improve spawning gravel composition for Chinook salmon. This Resource Action is not specific to location at this time; results from ongoing geomorphology studies (SP-G2) will be used to better define dredging and target locations in the low-flow reach. (FR-53)	E		X	X	X	X	X	Ongoing field analysis associated with SP-G2 will provide additional data. May impact water quality in the Feather River. Related to EWG-18.

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EWG-95	Low Flow Channel	Spawning Gravel Quantity	Gravel replacement on the lower reach spawning riffles if these areas are found to be of poor spawning quality (ongoing, SP-G2). (FR-55)	E		X	X	X			Ongoing field analysis associated with SP-G2 will provide additional data. Related to EWG-92.
EWG-96	Low Flow Channel	Hydraulic Characteristics of Channel Configuration	Mechanical or hydraulic changes to areas in the low flow reach have been suggested to improve fish habitat. This Resource Action could include several options, such as leveling off selected gravel bars so they are inundated at particular flows, dig side-channels that provide suitable velocity and cover for juvenile fishes, and reconfiguring selected sections of the stream channel to establish additional inundated benches to provide suitable splittail spawning habitat. (FR-54)	E	X	X		X	X	X	
EWG-97	Oroville Wildlife Area	Hydraulic Characteristics of Channel Configuration	Increase floodplain connectivity between OWA and mainstream Feather River with the goal of increasing inflow to selected OWA ponds during higher flows. (TC-34)	E	X	X	X	X	X	X	Related to EWG-22.
Fluvial Processes - Minimize Project Impacts on Erosion											
EWG-98	Lake Oroville	Erosion	Stabilize target stream and reservoir banks to prevent mass wasting. The appropriate bank stabilization method is unknown at this time. (LO-15)	P/E		X		X		X	
EWG-99	Upstream Tributaries	Erosion	Stabilize hillslope near Black Canyon and remove sediment barrier. Related to fish passage Resource Actions associated with sediment plugs. (LO-16)	P/E	X	X	X	X	X	X	Related to EWG-12 & EWG-39.
Additional Resource Actions to Add In											
EWG-100	OWA	Limited Wildlife Habitat for Migrating Waterfowl	Install wood duck nest boxes in the OWA.	E			X		X		Nest boxes installed in D-area of OWA to develop duck habitat.
EWG-101	Thermalito Complex	Insufficient Nursery Habitat	Use brood ponds as nursery habitat for warmwater species in the Thermalito Complex.	E			X		X		After rearing in brood ponds, fish could be seined out and placed in the Thermalito Complex.